Eastman Optifilm™ enhancer 400:
A nonmigratory coalescent

Eastman OPTIFILM™
400 enhancer

Eastman Optifilm™ enhancer 400 is an extremely low-emitting, low-odor coalescent. Unlike conventional volatile coalescents, Optifilm 400 remains in the paint film. Oftentimes, having a substance which remains in the paint film creates concerns related to potential migration.

This technical tip presents experimental results that demonstrate Optifilm 400 does not migrate to the surface of the paint film, even under extreme conditions.

The migration of any substance within a paint film can have a detrimental effect on the overall performance of the coating. Migration can occur at two different interfaces: the film-air interface or the film-substrate interface. Depending on where migration takes place, the coating can be affected in different ways. Any migration which occurs at the film-air interface can affect the appearance of the coating (i.e., the gloss level, degree, and type of dirt pickup), whereas migration at the film–substrate interface can lead to problems with intercoat adhesion and recoatability.

Environmental conditions can also significantly affect the probability and degree to which a substance within a film migrates. Therefore, during this 12-month evaluation, the paint films were conditioned at a high temperature (40°C) and high humidity (85% RH) to accelerate any potential exudate, as well as tested under ambient conditions.

No evidence of migration was detected in any of the paint films tested during this evaluation.

Experimental

Test paints included:

- High-PVC[1] (80%) Eastman Texanol™ ester alcohol[2]
- High-PVC (80%) Optifilm 400
- Low-PVC matte (~50%) Texanol[2]
- Low -PVC matte (~50%) Optifilm 400

The test paints were applied to Leneta scrub panels. One set of panels was stored at 40°C, 85% relative humidity in the Vötsch Climatic Test Chamber. The second set of panels was stored under ambient conditions (23°C). The panels were tested at regular intervals over a 12-month period.

Tests conducted on the paint films included blocking resistance, hardness development, colorant leaching, color transfer, sand dry time, and FT-IR ATR.

The paints were overloaded with a blue colorant to make it easier to visually detect any signs of migration from the test paints.

[1]Pigment volume concentration [2]Texanol was used as a control. Owing to its higher volatility, it does not remain in the paint film; therefore, it's not present to migrate.

Results

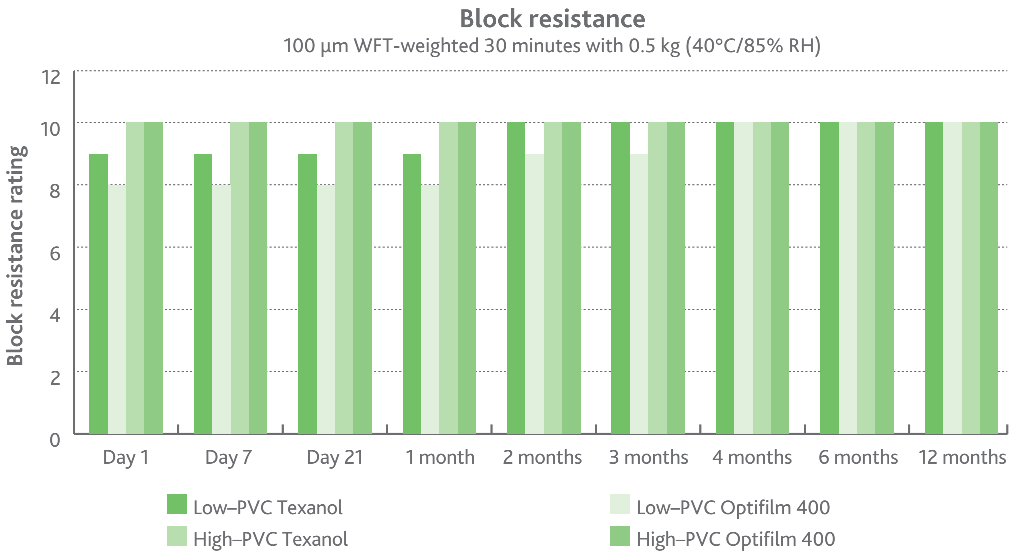
Final paint film properties

Blocking resistance

See Table 1 in the Appendix for the rating scale.

As mentioned earlier, any exudate present at the film-air interface would have resulted in a tacky substrate which inherently would have led to a notable reduction in the blocking resistance of the coating. As Figure 1 shows, all of the test paints improved in blocking resistance. This would suggest that no migration took place over the 12-month test period. Test method ASTM D4946 was used to determine blocking resistance.

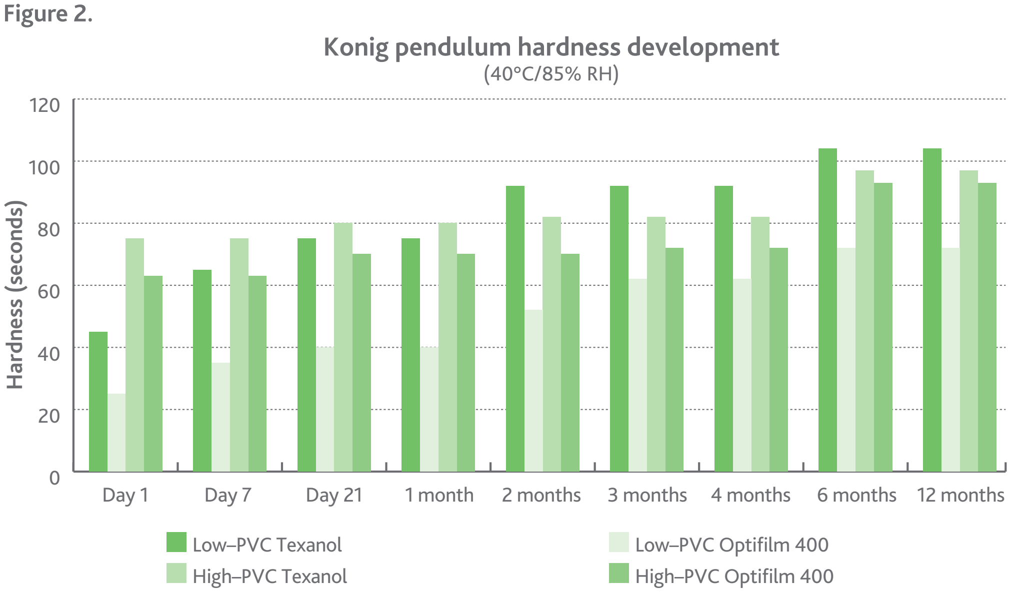
Figure 1.



Hardness development

Similarly with the hardness development test, any exudate present on the surface of the coating would have resulted in a reduction in the hardness development of the coating. All of the test films increased in hardness development, suggesting no migration took place over the 12-month test period. Hardness development was tested using method BS EN ISO 1522.

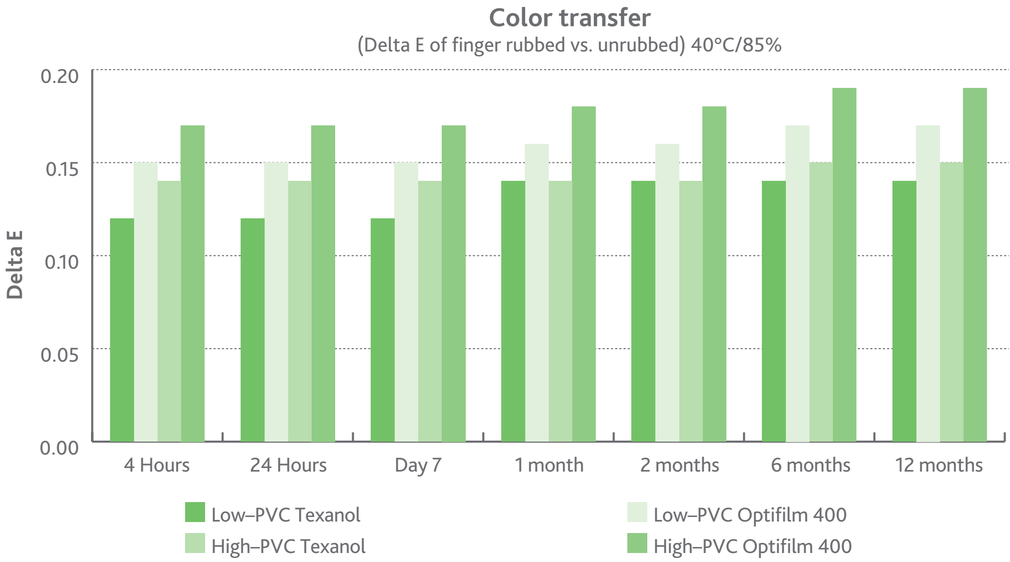
Figure 2.



Color transfer (Flocculation)

Using flocculation to test, the different paints showed no significant difference in color transfer. For results, see Figure 3.

Figure 3.



Sand dry time

Initially, the test paint containing Eastman Optifilm™ enhancer 400 had a higher sand dry time than the paint containing Eastman Texanol™ ester alcohol. From one month onwards, all the sand dry times were zero, which indicates that no migration took place. Test results are shown in Table 2 in the Appendix.

Colorant leaching

No differences in water streaking were seen between test paints formulated with Texanol and Optifilm 400, suggesting that no migration occurred in the paint film. Test method ASTM D7190-10-2011 was used to determine colorant leaching.

Fourier transforms infrared, attenuated total reflection

FT-IR ATR spectroscopy is a surface analysis technique which can be used to provide an infrared fingerprint of the film. This technique was used to analyze potential migration of substances from test paints containing Optifilm 400 and Texanol. No migration was detected from any of the paint films tested during this evaluation.

FT-IR ATR plots are available on request.

Conclusion

The results from the application tests and the FT-IR ATR spectroscopy study have demonstrated that, even when test paints formulated with Optifilm 400 are conditioned for a long period of time (12 months) under extreme environmental conditions (40°C, 85% RH), no migration of the low-emitting coalescent was evident.

For more information on the benefits of using Optifilm 400, visit **http://www.eastman.com/Literature_Center/C/COALCOAT020.pdf**.

APPENDIX

Table 1. Blocking resistance rating

Rating	Adhesion
10	No tack—perfect
9	Trace tack—excellent
8	Very slight tack—very good
7	Very slight tack— good to very good
6	Slight tack—good
5	Moderate tack—fair
4	Very tacky/no seal—fair to poor
3	5%–25% seal—poor
2	25%–50% seal—poor
1	50%–75% seal—very poor
0	75%–100% seal—total failure

Table 2. Sand dry time (minutes)

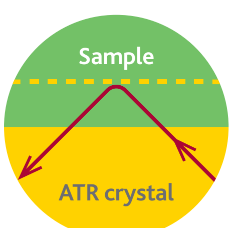
Paint	Day 0	1 month	6 months	12 months
Low-PVC matte (~50% PVC) Texanol	15	0	0	0
Low-PVC matte (~50% PVC) Optifilm 400	18	0	0	0
High-PVC (80% PVC) Texanol	18	0	0	0
High-PVC (80% PVC) Optifilm 400	22	0	0	0

FT-IR ATR method

Using a Sheen Instruments block applicator, the test paints were applied to black Leneta scrub panels at a wet-film thickness (WFT) of 100 µm. At each test interval, the test sample was run concurrently against a freshly prepared sample.

FT-IR ATR—Nicolet 6700, Golden Gate single-bounce ATR method was used.

Theoretically calculated depth of light penetration
A 45° angle of incidence and the sample refractive index of a general organic compound (n2 = 1.50)



Refractive index crystal > sample

Wavenumber/cm^{-1}	Prism (refractive index)
	Diamond (2.4)
4000	0.50 µm
3000	0.66 µm
2000	1.01 µm
1500	1.35 µm
1000	2.01 µm
4000	5.03 µm

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